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(19)

(54) IMPROVEMENTS IN AND RELATING TO KNITTED PILE FABRIC

(71) We, TEPPICHFABRICK KARL EYBL GESELLSCHAFT M.B.H., an Austrian Company of Karl Eyblgasse 1-3, Krems, Austria,

do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to a plain knitted pile fabric which comprises pile tufts which are knitted into at least some of the stitches of the knitted base fabric.

A knitted pile fabric is extensible in its longitudinal direction and particularly in its transverse direction, i.e., in the direction of its courses. Because this extensibility is excessively high for numerous uses, it is usual to adjust the fabric to a predetermined width and then to apply a finish to the rear side of the fabric.

It has been suggested, for example, to introduce a filling thread into courses of the base knitted fabric of a pile fabric which is to be stitched or made into a garment and should simulate a natural fur as closely as possible. The filling thread has to be introduced in such a way that the resiliency of the base knitted fabric, which may consist of elastic threads, is preserved. For this reason the filling thread has a much higher elasticity than the thread of the base fabric so that the filling thread merely increases the elastic resoring force of the base fabric without reducing its elasticity.

In webs consisting of a knitted base fabric and loose pile fibers it is known to knit a U-shaped pile tuft into a stitch of a course and to bridge said course with the two legs of the tuft, which legs are of equal length and are tied into the adjacent stitches of the next course. In order to hold the knitted fabric together in its transverse direction, filling threads are tied in predetermined courses and stitches between the first and second tying points of the pile tufts, which are tied in twice. The useful width and the extensibility in width of these fabrics are not defined by the filling threads but are defined by a more or less through filling of the fabric, which may be tubular or cut open and is covered with pile fibers on both sides.

According to the present invention there is provided a plain weft knitted pile fabric comprising a portion comprising a knitted base fabric comprising stitches knitted from a stitch-forming yarn, pile tufts knitted in selected stitches of said base fabric, and filling yarn which is laid in at least some of the stitches of some of the courses of the base fabric, the filling yarn not participating in the forming of the stitches of the base fabric, the thickness of the filling yarn being at least equal to the thickness of the stitch-forming yarn and the extensibility of the filling yarn being at most equal to the extensibility of the stitch-forming yarn, the filling yarn and the stitch-forming yarn each comprising at least one thread.

A pile fabric made according to the invention can have virtually its useful width as it is removed from the machine and can preserve that useful width while not being entirely inextensible in its transverse direction. A finish may be applied but is not necessary. It has been found that the provision of the filling yarns results in a higher density of the base fabric even at untufted stitches. For this reason, tufted and untufted stitches may be arranged in a pattern in part of the area of the fabric or throughout the area of the fabric so that a patterned fabric is obtained. Specifically, the filling yarn may impart such a high density to the fabric at the untufted stitches that the visibility of the stitch-forming yarn on the back of the fabric is decreased. The resulting higher density results in a more uniform distribution of the residual extensibility and of the appearance of untufted stitches to such an extent that the presence of portions of courses consisting only of untufted stitches will not result in intolerable changes in extensibility or appearance. In a preferred arrangement, which results in a great increase in density and a high uniformity, the filling yarn is tied over the needle loop in one

stitch and under the needle loop in an adjacent stitch of the same course. The same result can be produced if the filling yarn is laid over the needle loop of one stitch and under the needle loop of an adjacent stitch of the same wale.

Filling yarns which are tied into the base fabric can also improve the tying in of the pile tufts. The fabric may intentionally comprise pile tufts of at least two different kinds, such as tufts made from different fibers, tufts made from fibers differing in length and tufts made from fibers differing in color. The possibility of providing a fabric according to the invention with a pattern is greatly increased in this way.

The plain fabric may comprise other portions in which different stitch-forming yarns are used. In this case the yarns are equal in number to the different portions and the structures of the different portions are equivalent in that each yarn forms the stitches in one portion, the other yarns serving as filling yarns to increase the density of the fabric. Considering any one course, the portions are linear. Considering adjacent courses, which have been knitted in succession, the linear portions may overlap so that the fabric comprises regions which may be arranged in a pattern. The fabric may comprise courses which are divided into tufted and untufted portions and may include areas which are divided into tufted and untufted portions. In the latter case, the division into tufted portions and untufted portions is independent of the division into portions having different stitch-forming yarns. The use of at least two yarns which in alternating portions constitute a stitch-forming yarn and a filling yarn enables an interesting modification because the yarns need not have the same total thread thickness. In general, the tufted stitches are desirably knitted from a yarn which has a relatively small thickness so that pile tufts, which are large in cross-section, can be tied in. For this reason, in a pile fabric according to the invention comprising a base fabric made from yarns having different total thread thicknesses, it is desirable to form the stitches of a tufted zone from a yarn having a smaller total thread thickness and to form the stitches of the untufted zones from a yarn having a larger total thread thickness.

A known knitted pile fabric comprises a base fabric consisting of fibrillated yarn, which consists of synthetic thermoplastic material and is thermoset when it has been knitted so that the need for a finishing of the fabric is eliminated. In the knitted pile fabric according to the invention at least one of the yarns forming the fabric may also consist at least in part of a low-melting thermoplastic material, such as a synthetic polymer, and that yarns may be fused completely or in part to tie in the pile tufts with virtually invisible joints.

Illustrative embodiments of the invention will now be described more fully with reference to the accompanying drawings, in which:

Figs. 1 to 7 are stitch pattern diagrams of respective embodiments of knitted fabrics according to the present invention.

The pile fabric which is shown in Fig. 1 comprises a base fabric comprising stitches which are knitted from a base yarn that is designated G_1, G_2, G_3, G_4 in the courses which have been knitted in succession. Stitches which are aligned in a direction normal to the direction of the courses form wales, *a, b, c, d, e, f*. It is apparent that pile tufts are not provided in all stitches but are provided only in the stitches of wales *a, b, c* and that these pile tufts are knitted into the needle loops. That portion of the fabric which is represented by the stitch pattern diagram has in each course two adjoining portions which consist of three wales each and which together with corresponding portions of adjacent courses form regions of the fabric. Of these portions of each course, only the portion including wales *d, e, f* contains only untufted stitches. It will be understood that the specific division which has been shown is by no means essential. The tufted portions in each course need not extend as far as to one and the same wale and it is not necessary to provide tufted stitches in all courses. It is apparent that the division into tufted and untufted portions may be selected in various ways so that pile fabrics having numerous different patterns may be provided. All courses include a lay-in or filling yarn which has portions designated F_1, F_2, F_3, F_4 in respective courses which have been formed in succession. In this embodiment, the total thread thickness of said filling yarn exceeds the total thread thickness of the base threadline, but the filling yarn is no more extensible than the base yarn. The filling yarn is tied into alternate stitches of the courses and of the wales. In the lowermost course, the filling yarn F_1 is tied into the sinker loops of the base yarn G_1 and lies in the needle loops of wales *b, d,* and *f* as a tuck loop. In the needle loops of wales *a* and *c*, the filling yarns floats and forces the pile fibers which have been knitted with the base yarn G_1 against the needle loop of the previously formed course so that the pile is tied in more securely in these stitches. It is also apparent that the filling yarn F_1 reinforces the sinker loops formed by the base yarn G_1 and thus stabilizes the fabric. Because the filling yarn F_1 is much thicker than the

base yarn G_1, the wales *d*, *e* and *f* are also denser and no longer seem to be transparent.

In the next course formed by the base yarn G_2, the filling yarn F_2 is tied in by the sinker loops to form, in the embodiment shown, tuck loops in the needle loops of those wales in which the filling yarn F_1 floats in the first course.

The stitch pattern diagram shown in Fig. 2 represents substantially the same structure as that of Fig. 1 but the filling yarns F_1, F_2, F_3 and F_4 lie in the same wales on and under the needle loops, respectively. The filling yarns may alternatively be tied in alternate courses or in courses arranged in larger intervals and may always lie on the upper needle loop in the same wale or in wales which are offset, as desired. In the structure of Fig. 3, filling yarns are inserted in alternate courses and lie on needle loops which are staggered. In the fabric shown in Fig. 4, the filling yarn is arranged as in Fig. 1 but pile tufts of a first kind in respect of color, material composition, fiber thickness or fiber length are tied in wales *a* and *b*, pile tufts of a second kind are tied in wales *d*, *e*, and the stitches of wales *c* and *f* are untufted. The arrangement and number of different pile tufts may differ from the fabric shown when it is desired to form a predetermined pattern. Fig. 5 is a stitch pattern diagram of a fabric in which two filling yarns are tied in each course, namely, filling yarns F_1a and F_1b in the first course, filling yarns F_2a and F_2b in the second course, etc. This results in a particularly dense base fabric having a restricted extensibility.

In the embodiments described hereinbefore, the sitches are formed by a base yarn which serves only that purpose and the density of the fabric is increased by at least one separate filling yarn. The embodiments shown in Figs. 6 and 7 are different in that they comprise two yarns and the fabric comprises two adjacent regions, in one of which the first yarn is used to form the stitches and the second yarn is used to increase the density of the fabric whereas in the other zone the second yarn is used to form the stitches and the first yarn is used in increase the density of the fabric. Fig. 6 is a stitch pattern diagram showing five courses, which have been knitted in succession from bottom to top, and eight wales 1a, 1b, 1c, 1d, and 2a, 2b, 2c, 2d. In that portion of the fabric which consists of wales 1a to 1d, the stitches are formed by a a yarn that is represented by a solid line and designated 11, 12, 13, 14, 15 in respective courses. A second yarn is represented by a dotted line and designated 21, 22, 23, 24, 25 and serves in that portion as a filling yarn. In the adjacent portion, which consists of wales 2a to 2d, the stitches are formed by the second yarn, represented by a dotted line, and the filling yarn consists of the first yarn indicated by a solid line. Pile tufts have not been shown, for the sake of clearness. Such pile tufts may be knitted in all or in selected stitches of one portion or of each portion, as has been described. It is repeated that the base fabric may have courses consisting of more than two such portions and in accordance therewith may be composed of a corresponding number of yarns, which forms the stitches in respective portions whereas the remaining yarns are tied in these portions as filling yarns.

In this embodiment, each portion of each course contains all the yarns, one of which serves as a stitch-forming yarn and the others serve as filling yarn.

Additional filling yarns may be used as shown in Fig. 7 which shows a pile fabric which includes an additional filling yarn, which is designated F_1 to F_4 in the successive courses and which is tied in in accordance with Fig. 4. It is noted that the alternate tying of the filling yarn at the boundaries between the regions of the fabric may be effected not only in the manner shown in Figs. 6 and 7 but also in any other manner which is known from loop-sinking technology.

From the foregoing and from the drawings it is apparent that the above described pile fabric has an increased density throughout at least some of its area and that this has been accomplished in an extremely simple manner, and that the extensibility of the fabric is restricted to a predetermined extent and is highly uniform so that a pattern of elemental portions, which include untufted regions, may be provided. Even in such untufted regions, the fabric is so dense that it does not appear to be thin and is not transparent in such regions. In general it is sufficient to use filling yarns which have the same or slightly greater total yarn thickness as the stitch-forming yarns, but the yarn thickness of the filling yarns which do not form stitches may greatly exceed this lower limit in dependence on the requirements in each case.

The fabric may be finished on its back, e.g., when this is desired by the customer, although such finished is not necessary. However this opens up an advantageous possibility. If the base fabric contains at least one yarn which consists entirely or in part of a low-melting synthetic thermoplastic, such as polyethylene, and the pile tufts are additionally tied in by this yarn, this yarn can be fused at least in part and a nap can be raised on the fabric by pulling part of the pile fibers through the fabric from the back to the front.

In general the threads of yarns made of two or more threads are substantially parallel or are joined together, e.g., by twisting.

WHAT WE CLAIM IS: —

1. A plain weft knitted pile fabric comprising a portion comprising a knitted base fabric comprising stitches knitted from a stitch-forming yarn, pile tufts knitted in selected stitches of said base fabric, and filling yarn which is laid in at least some of the stitches of some of the courses of the base fabric, the filling yarn not participating in the forming of the stitches of the base fabric, the thickness of the filling yarn being at least equal to the thickness of the stitch-forming yarn and the extensibility of the filling yarn being at most equal to the extensibility of the stitch-forming yarn, the filling yarn and the stitch-forming yarn each comprising at least one thread.

2. A fabric according to claim 1, wherein the filling yarn is laid in over the needle loop of one stitch and under the needle loop of an adjacent stitch of the same course of the base fabric.

3. A fabric according to either claim 1 or claim 2, wherein the filling yarn is laid in over the needle loop of one stitch and under the needle loop of an adjacent stitch of the same wale of the base fabric.

4. A fabric according to any of claims 1 to 3, comprising at least two kinds of pile tufts.

5. A fabric according to any of claims 1 to 4, comprising courses having at least two adjoining portions one of these portions containing only untufted stitches.

6. A fabric according to any one of claims 1 to 5, comprising a second portion, wherein the base fabric of the second portion is knitted from the filling yarn of the first portion, and the filling yarn of the second portion is the stitch-forming yarn of the first portion.

7. A fabric according to any one of claims 1 to 6, wherein part of the pile fibers are pulled from the back to the front by napping.

8. A fabric according to claim 7, wherein at least one yarn of the fabric consists at least in part of a low-melting thermoplastic material and the pile tufts are additionally tied in with virtually invisible joints in that said yarn is at least partly fused subsequent to knitting.

9. A plain knitted pile fabric, substantially as herein described with reference to the accompanying drawings.

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1584324 COMPLETE SPECIFICATION
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Sheet 1

Fig.1

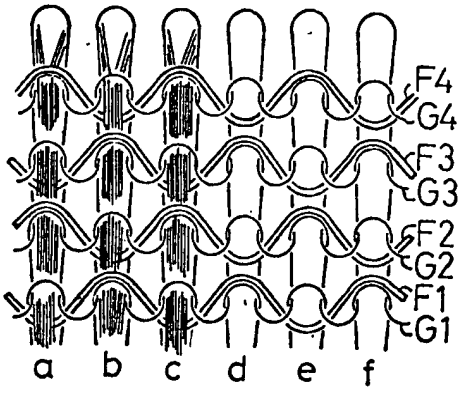
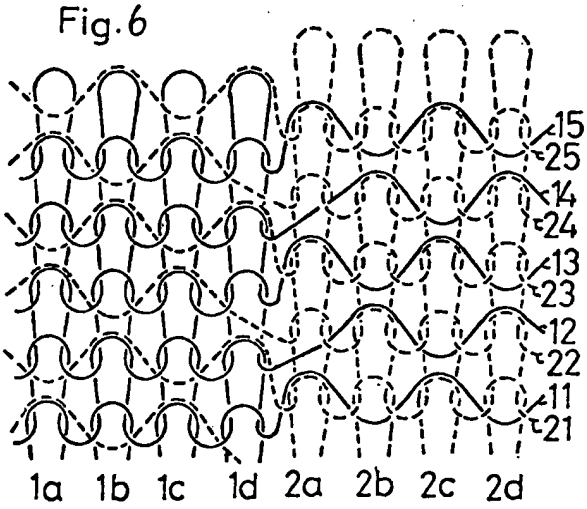


Fig.6



1584324 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

Fig.2

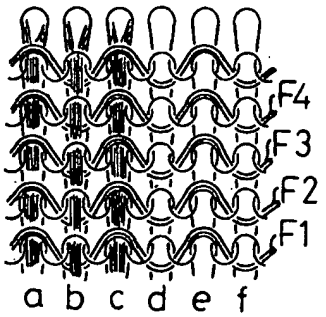


Fig.3

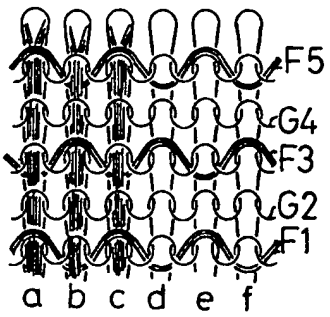


Fig.4

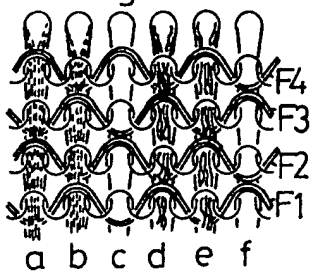


Fig.5

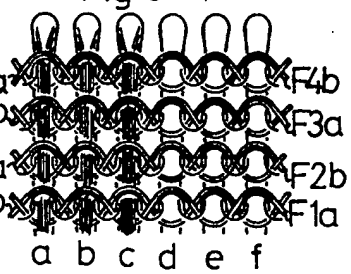


Fig.7